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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/792,101	03/03/2004	Jie Xue	CIS03-69(8041)	4081

7590 10/06/2005

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EXAMINER	
CHANDRAN, BIJU INDIRA	

ART UNIT	PAPER NUMBER
2835	

DATE MAILED: 10/06/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

AK

Office Action Summary	Application No.	Applicant(s)	
	10/792,101	XUE ET AL.	
	Examiner	Art Unit	
	Biju Chandran	2835	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 March 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) *17-20* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *2/7/05*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

Restriction to one of the following inventions is required under 35 U.S.C. 121:

I. Claims 1 - 16, drawn to a circuit board component which provides EMI shielding, classified in class 361, subclass 704.

II. Claims 17 - 20, drawn to the process of making the said circuit board component, classified in class 29, subclass 831.

The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the product can be made by a materially different electronic packaging techniques.

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

During a telephone conversation with Mr. David Huang on 09/26/05 a provisional election was made without traverse to prosecute the invention of I, claims 1-16. Affirmation of this election must be made by applicant in replying to this Office action.

Claims 17 - 20 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Claim Objections

1. Claims 2, 3, 6, 7, 10, 15 and 16 are objected to because of the following informalities: "escape of electromagnetic interface from...." has been interpreted as "escape of electromagnetic interference from...." . Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

2. Claims 5, 14 and 16 are rejected under 35 U.S.C. 102(a) as being anticipated by Oggioni et al.

- Regarding claim 5, Oggioni et al. discloses a circuit board component, comprising: a substrate having non-conductive material and conductive material supported by the non-conductive material (paragraph 0033), the conductive material defining (i) a circuit board interface, (ii) a die interface, (iii) a heat spreader interface, and (iv) a set of connections which interconnects the circuit board interface, the die interface and the heat spreader interface', a die coupled to the die interface defined by the conductive material of the substrate (paragraph 0035), the die including integrated circuitry which is configured to electrically communicate with a circuit board when the circuit board couples to the circuit board interface defined by the conductive material of the substrate (paragraphs 0021, 0035); and a heat spreader coupled to the heat spreader interface defined by the conductive material of the substrate, the heat spreader being configured to dissipate heat from the die (paragraph 0004), the heat spreader in combination with the heat spreader interface forming an electromagnetic interference shield when a portion of the circuit board interface connects to a ground reference of the circuit board through the circuit board interface (paragraphs 0009, 0022).
- Regarding claim 14, Oggioni et al. discloses a circuit board component, comprising: a heat spreader configured to dissipate heat from the circuit board component (paragraph 0004); a substrate having

non-conductive material and conductive material supported by the non-conductive material (paragraph 0033), the conductive material defining (i) a circuit board interface, (ii) a die interface, (iii) heat spreader connecting means (201) for physically and electrically connecting to the heat spreader, and (iv) a set of connections which interconnects the circuit board interface, the die interface and the heat spreader connecting means (paragraphs 0021, 0022, 0035), wherein the heat spreader and the heat spreader connecting means form an electromagnetic interference shield when a portion of the circuit board interface connects to a ground reference of a circuit board through the circuit board interface (paragraph 0009, 0022); and a die coupled to the die interface defined by the conductive material of the substrate (paragraph 0035), the die including integrated circuitry which is configured to electrically communicate with the circuit board when the circuit board couples to the circuit board interface defined by the conductive material of the substrate (paragraph 0021).

- Regarding claim 16, Oggioni et al. further discloses a heat spreader interface defined by the conductive material of the substrate which includes: conductive ground plates disposed along a flat surface of the substrate, the conductive ground plates encircling the die interface in a 360 degree manner (Top surface of PTH's '201' in figure 2 & 3 that contact the heat spreader '401' constitute the conductive ground plane)

to minimize escape of electromagnetic interface from the die during operation of the integrated circuitry (Oggioni et al., paragraph 0009).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-4, 6-8,10-13, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oggioni et al. (PGPub US 2003/0174478) in view of Takeuchi (PGPub US 2003/0122242 A1).

   - Regarding claim 1, Oggioni et al. discloses a circuit board module, comprising: a circuit board having a component mounting location; a circuit board component mounted to the component mounting location of the circuit board (Figure 3), the circuit board component including: a substrate having non-conductive material and conductive material supported by the non-conductive material (paragraph 0033), the conductive material defining (i) a circuit board interface, (ii) a die interface, (iii) a heat spreader interface, and (iv) a set of connections which interconnects the circuit board interface, the die interface and the heat spreader interface, a die coupled to the die interface defined by the conductive material of the substrate (paragraph 0035), the die

including integrated circuitry which is configured to electrically communicate with a circuit board when the circuit board couples to the circuit board interface defined by the conductive material of the substrate (paragraph 0021, 0035), and a heat spreader coupled to the heat spreader interface defined by the conductive material of the substrate, the heat spreader being configured to dissipate heat from the die (paragraph 0004), the heat spreader in combination with the heat spreader interface forming an electromagnetic interference shield when a portion of the circuit board interface connects to a ground reference of the circuit board through the circuit board interface (paragraph 0009, 0022). Oggioni et al. do not disclose a heat sink in thermal communication with the heat spreader. Takeuchi discloses a heat sink in thermal communication with the hear spreader of a circuit board module (Figure 6). At the time the invention was made, it would have been obvious to one of ordinary skill in the art to incorporate the heat sink in contact with the heat spreader as taught by Takeuchi in the circuit board module as disclosed by Oggioni et al. to improve thermal dissipation (Takeuchi, paragraph 0023).

- Regarding claim 2, Oggioni et al. further discloses a heat spreader interface defined by the conductive material of the substrate of the circuit board component which includes a conductive ground plane disposed along a flat surface of the substrate (Top surface of PTH's

'201' in figure 2 & 3 that contact the heat spreader '401' constitute the conductive ground plane) which minimizes the escape of electromagnetic interference from the die during operation of the integrated circuitry (paragraph 0010). Oggioni et al. do not disclose that the conductive ground plane completely encircles the die interface in a 360 degree manner. Takeuchi discloses a ground plane that completely encircles the die in a 360 degree manner (paragraph 0027). At the time the invention was made, it would have been obvious to one of ordinary skill in the art to incorporate the ground plane that completely encloses the die in a 360 degree manner as taught by Takeuchi in the circuit module as disclosed by Oggioni et al., to create a complete EMI fence around the die (Oggioni et al., paragraph 0009).

- Regarding claim 3, Oggioni et al. further discloses a circuit board module of claim 1 wherein the heat spreader interface defined by the conductive material of the substrate of the circuit board component includes: conductive ground plates disposed along a flat surface of the substrate, the conductive ground plates encircling the die interface in a 360 degree manner (Top surface of PTH's '201' in figure 2 & 3 that contact the heat spreader '401' constitute the conductive ground plane) to minimize escape of electromagnetic interface from the die during operation of the integrated circuitry (Oggioni et al., paragraph 0009).

- Regarding claim 4, Oggioni et al discloses a circuit board module, comprising: a circuit board having a component mounting location (Figure 3); a circuit board component mounted to the component mounting location of the circuit board, the circuit board component including: a heat spreader configured to dissipate heat from the circuit board component (paragraph 0004), a substrate having non-conductive material and conductive material supported by the non-conductive material (paragraph 0033), the conductive material defining (i) a circuit board interface, (ii) a die interface, (iii) heat spreader connecting means (201) for physically and electrically connecting to the heat spreader (paragraph 0033), and (iv) a set of connections which interconnects the circuit board interface, the die interface and the heat spreader connecting means (paragraphs 0021 & 0022), wherein the heat spreader and the heat spreader connecting means form an electromagnetic interference shield when a portion of the circuit board interface connects to a ground reference of the circuit board through the circuit board interface (figure 3, paragraph 0009), and a die coupled to the die interface defined by the conductive material of the substrate, the die including integrated circuitry which is configured to electrically communicate with the circuit board when the circuit board couples to the circuit board interface (paragraph 0021) defined by the conductive material of the substrate. and a heat sink in

thermal communication with the heat spreader of the circuit board component. Oggioni et al. do not disclose a heat sink in thermal communication with the heat spreader. Takeuchi discloses a heat sink in thermal communication with the hear spreader of a circuit board module (Figure 6). At the time the invention was made, it would have been obvious to one of ordinary skill in the art to incorporate the heat sink in contact with the heat spreader as taught by Takeuchi in the circuit board module as disclosed by Oggioni et al. to improve thermal dissipation (Takeuchi, paragraph 0023).

- Regarding claim 6, Oggioni et al. satisfy all the limitations of claim 5. and further discloses a heat spreader interface that includes a conductive ground plane disposed along a flat surface of the substrate (top surface of PTH's '201' in figure 2 & 3 that contact the heat spreader '401' constitute the conductive ground plane) which minimizes the escape of electromagnetic interference from the die during operation of the integrated circuitry (paragraph 0010). Oggioni et al. do not disclose that the conductive ground plane completely encircles the die interface in a 360 degree manner. Takeuchi discloses a ground plane that completely encircles the die in a 360 degree manner (paragraph 0027). At the time the invention was made, it would have been obvious to one of ordinary skill in the art to incorporate the ground plane that completely encloses the die in a 360

degree manner as taught by Takeuchi in the circuit module as disclosed by Oggioni et al., to create a complete EMI fence around the die (Oggioni et al., paragraph 0009).

- Regarding claim 7, Oggioni et al. as modified by Takeuchi discloses all the limitations of claim 6, and further disclose that the conductive ground plane of the heat spreader extends along an outer periphery of the substrate (Figure 4). Oggioni et al. do not disclose a conductive ground edge disposed along the outer periphery of the substrate, the conductive ground edge being contiguous with the conductive ground plane and extending from the conductive ground plane in a substantially perpendicular manner relative to the conductive ground plane to minimize escape of electromagnetic interference from the substrate during operation of the integrated circuitry. Takeuchi et al. discloses a conductive ground edge disposed along the outer periphery of the substrate, the conductive ground edge being contiguous with the conductive ground plane and extending from the conductive ground plane in a substantially perpendicular manner relative to the conductive ground plane (figures 3 & 4) to minimize escape of electromagnetic interference from the substrate during operation of the integrated circuitry (paragraph 0004). At the time the invention was made, it would have been obvious for one of ordinary skill in art to incorporate the conductive ground edge disposed along

the outer periphery of the substrate with the conductive ground edge contiguous with the conductive ground plane and extending from it in a substantially perpendicular manner, as taught by Takeuchi in the circuit board component as taught by Oggioni et al. to be able to incorporate more electrical components under heat spreader and to provide EMI protection for them (Takeuchi, figure 7, paragraph 0025, 0026).

- Regarding claim 8, Oggioni et al. further discloses that the heat spreader includes a main portion which extends along the flat surface of the substrate in a substantially parallel manner relative to the flat surface of the substrate; and an edge portion which extends along the outer periphery of the substrate in a substantially parallel manner relative to the outer periphery of the substrate, where the edge portion is contiguous with the main portion. Oggioni et al. do not disclose that the edge portion extends from the main portion in a substantially perpendicular manner relative to the main portion. Takeuchi et al. disclose a heat spreader where the edge portion extends from the main portion in a substantially perpendicular manner relative to the main portion. At the time the invention was made, it would have been obvious to one of ordinary skill in the art to incorporate the heat spreader where the edge portion extends from the main portion in a substantially perpendicular manner relative to the main portion, as taught by Takeuchi in the circuit board component as taught by

Oggioni et al. to create a complete EMI fence around the die (Oggioni et al., paragraph 0009).

- Regarding claim 10, Oggioni et al. as modified by Takeuchi satisfies all the limitations of claim 5, and further disclose that the heat spreader interface includes: conductive ground plates disposed along a flat surface of the substrate, the conductive ground plates encircling the die interface in a 360 degree manner (top surface of PTH's '201' in figure 2 & 3 that contact the heat spreader '401' constitute the conductive ground plane) to minimize escape of electromagnetic interface from the die during operation of the integrated circuitry (paragraph 0010).
- Regarding claim 11, Oggioni et al. do not disclose a ring shaped solder joint formed from high temperature solder which forms an electromagnetic interference seal between the heat spreader and the heat spreader interface defined by the conductive material of the substrate. Takeuchi discloses a ring shaped solder joint ('408', paragraph 0019) formed from high temperature solder which forms an electromagnetic interference seal between the heat spreader and the heat spreader interface defined by the conductive material of the substrate (paragraph 0004, 0015).
- Regarding claim 12, Oggioni et al. further discloses the heat spreader interface is disposed along a first flat surface of the substrate (figure 4),

wherein the circuit board interface is disposed along a second flat surface of the substrate (figure 2 & 4), wherein the first and second flat surfaces are substantially parallel to each other, wherein the circuit board interface includes an array of pads, and wherein the circuit board component further comprises: an array of circuit board contacts coupled to the array of pads, the array of circuit board contacts being configured to mount to an area array component mounting location of the circuit board using a surface mount technology soldering process (paragraph 0009, 0035).

- Regarding claim 13, Oggioni et al. further discloses that circuit board component is an Application Specific Integrated Circuit (paragraphs 0015, 0016).
- Regarding claim 15, Oggioni et al. discloses all the limitations of claim 14, and further discloses a heat spreader interface defined by the conductive material of the substrate which includes a conductive ground plane disposed along a flat surface of the substrate (Top surface of PTH's '201' in figure 2 & 3 that contact the heat spreader '401' constitute the conductive ground plane) which minimizes the escape of electromagnetic interference from the die during operation of the integrated circuitry (paragraph 0010). Oggioni et al. does not disclose that the conductive ground plane completely encircles the die interface in a 360 degree manner. Takeuchi discloses a ground plane

that completely encircles the die in a 360 degree manner (paragraph 0027). At the time the invention was made, it would have been obvious to one of ordinary skill in the art to incorporate the ground plane that completely encloses the die in a 360 degree manner as taught by Takeuchi in the circuit module as disclosed by Oggioni et al., to create a complete EMI fence around the die (Oggioni et al., paragraph 0009).

4. Claim 9 rejected under 35 U.S.C. 103(a) as being unpatentable over Oggioni et al. in view of Takeuchi as applied to claim 8 above, and further in view of Lee at al. (PGPub US 2004/0150102 A1). Oggioni as modified by Takeuchi satisfies all the limitations of claim 8, and further disclose electrically conductive material which forms an electromagnetic interference seal between the main portion of the heat spreader and the conductive ground plane of the heat spreader interface. However, Oggioni et al does not disclose electrically conductive material between the edge portion of the heat spreader and the conductive ground edge of the heat spreader interface. Lee et al. discloses electrically conductive material, which forms an electromagnetic interference seal between the edge portion of the heat spreader and the conductive ground edge of the heat spreader interface (figure 5, paragraph 0029). At the time the invention was made, it would have been obvious to one of ordinary skill in the art to incorporate the electrically

conductive material between the edge portion of the heat spreader and the conductive ground edge of the heat spreader interface, as taught by Lee et al., in the circuit board component disclosed by Oggioni et al. to create a complete EMI fence around the die (Oggioni et al., paragraph 0009).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Biju Chandran whose telephone number is (571) 272-5953. The examiner can normally be reached on 8AM - 5PM. Mon-Fri.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lynn Feild can be reached on (571) 272-2092. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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